

## CALIFORNIA ENERGY COMMISSION

1516 NINTH STREET  
SACRAMENTO, CA 95814-5512



**DATE:** November 1, 2004

**TO:** Interested Parties

**FROM:** Nancy Tronaas, Compliance Project Manager

**SUBJECT: Sycamore Cogeneration Project (84-AFC-6C)  
Staff Analysis of Proposed Modifications  
to Allow Either Cogen or Simple-Cycle Operations and  
Extending the License to Operate**

On August 17, 2004, the California Energy Commission received a petition from the Sycamore Cogeneration Company (SCC), to amend the Energy Commission Decision for the Sycamore Cogeneration Project. The 300 megawatt SCP was certified in 1986 and commenced commercial operations in 1988. The power plant is located approximately five miles north of the City of Bakersfield, and five miles east of State Route 99 in the Kern River oilfields in Kern County, California.

SCC requests that two of the four existing cogeneration units (i.e., natural gas fired combustion turbines equipped with dry Low NOx combustors and heat recovery steam generators) be permitted to operate either in simple-cycle mode, or in cogeneration mode. This request is due to (1) a decline in steam demand from the adjacent oilfield, and (2) the need for flexibility to respond to the current electricity market. No additional physical construction will be necessary to switch between simple-cycle and cogeneration operations. The petition also requests to modify the air quality conditions of certification for consistency with the San Joaquin Valley Air Pollution Control District's permits, and to eliminate the 20-year expiration of the Energy Commission's license.

Energy Commission staff reviewed the petition and assessed the impacts of this proposal on environmental quality, public health and safety, and proposes revisions to existing conditions of certification for Air Quality (AQ-13, -18, -19, and -30), and Engineering/Efficiency (Condition #1). Staff also supports allowing the project to operate indefinitely and elimination of the 20-year license expiration to avoid unnecessary retirement of power plants to help maintain the reserve margin and system reliability. It is staff's opinion that, with the implementation of revised conditions, the project will remain in compliance with applicable laws, ordinances, regulations, and standards and that the proposed modifications will not result in a significant adverse direct or cumulative impact to the environment (Title 20, California Code of Regulations, Section 1769).

The amendment petition has been posted on the Energy Commission's webpage at [www.energy.ca.gov/sitingcases](http://www.energy.ca.gov/sitingcases). Staff's analysis is attached for your information and review. Staff's analysis and the order (if the amendment is approved) will also be posted on the webpage. Energy Commission staff intends to recommend approval of the petition at the December 1, 2004 Business Meeting of the Energy Commission. If you have comments on this proposed modification, please submit them to me at the address below prior to November 30, 2004:

California Energy Commission  
1516 9<sup>th</sup> Street, MS 2000  
Sacramento, CA 95814

Comments may be submitted by fax to (916) 654-3882, or by e-mail to [ntronaas@energy.state.ca.us](mailto:ntronaas@energy.state.ca.us). If you have any questions, please contact Nancy Tronaas, Compliance Project Manager, at (916) 654-3864.

Attachments

**SYCAMORE COGENERATION PROJECT (84-AFC-6C)**  
Petition to allow for Either Cogen or Simple Cycle Operation  
Air Quality Staff Analysis  
Prepared by: Joseph M. Loyer  
October 5, 2004

**AMENDMENT REQUEST**

The Sycamore Cogeneration Company (SCC) petitioned the California Energy Commission on August 18, 2004, to amend Conditions of Certification of the Sycamore Cogeneration Power Project (Sycamore) to allow the simple cycle operation of two of the four existing combustion turbines. This would allow SCC to maintain electric power production for the electricity market while responding to reduced steam production requirements for thermally enhanced oil recovery (TEOR) activities in the adjacent oil field.

SCC specifically proposes to delete Condition of Certification AQ-13 and modify Conditions AQ-18, -19 and -30.

**BACKGROUND**

SCC was granted a license to operate in December of 1986 for a 300 MW cogeneration project in Kern County, California. Sycamore is under the jurisdiction of the San Joaquin Valley Air Pollution Control District (District). The facility consists of four 75-MW natural gas combustion turbines with unfired heat recovery steam generators (HRSG) and is currently equipped with Dry Low NO<sub>x</sub> (DLN) combustors to minimize NO<sub>x</sub> (oxides of nitrogen) emissions. The HRSGs are capable of delivering 450,000 pounds/hour of steam to the adjacent oil field for use in TEOR activities and ancillary equipment. SCC has previously petitioned the Energy Commission for a number of modifications that have been granted. These include minor modifications to the heat-input rates and emission sampling procedures, eliminating oil as a backup fuel for the combustion turbines, and the installation of DLN combustors. Since initial operation, SCC has demonstrated compliance with all permit restrictions with the District, the Energy Commission, and the U.S. Environmental Protection Agency (EPA).

**LAWS, ORDINANCES, REGULATIONS AND STATUTES**

No laws, ordinances, regulations, or standards will affect the petitioned amendment requests. However, the District did require SCC to demonstrate how this petition would not deter Sycamore from complying with District Rule 4703, an applicable pollution device retrofit rule that limits the emissions of NO<sub>x</sub> and carbon monoxide (CO) from stationary gas turbines. The Sycamore turbines comply with the emission limits and monitoring requirements of this rule. Rule 4703 also requires future, more stringent emission controls. SCC has chosen to undertake what is referred to in Rule 4703 as the "Enhanced Option", which requires NO<sub>x</sub> emissions to be controlled to 3 ppmv @ 15% O<sub>2</sub> by 2008 or the first major overhaul. The District is satisfied that compliance with Rule 4703 will not be hindered by the approval of this petition.

## **ANALYSIS**

SCC is petitioning the Commission to allow two of the existing four combustion turbines at Sycamore to operate in simple cycle mode as necessary, rather than cogeneration mode. This will allow SCC to respond to a decline in the need for steam production for the oil field while maintaining current power production for the electricity market in accordance with its existing contract and the ability to dispatch under anticipated future market conditions.

While in simple cycle operation, the turbines are expected to start up and shut down in a single day. While in cogeneration operation, the turbines are expected to start up and stay operational for extended periods. SCC is not petitioning to increase the emission limits of Sycamore. Therefore, this assessment will focus on the ability of SCC to comply with the existing emission limits. However, the District has updated (but not increased) some of the emission limits to be more consistent with current District practices. Specifically, this means the merging of emissions limits for SO<sub>2</sub> and SO<sub>4</sub> into SO<sub>x</sub> (measured as SO<sub>2</sub>). Additionally, SCC has found an oversight in Condition of Certification AQ-30 that was previously amended and needs to be corrected to be consistent with Condition of Certification AQ-5g.

### **Conversion to Simple Cycle Operation**

The Project will require no additional construction to convert Units 1 and 4 to simple cycle operation as each unit's flue gases currently pass through a heat recovery steam generator (HRSG) by way of a transition section that is equipped with a gas tight damper and bypass stack. Therefore, for simple cycle operation all that is necessary is to employ the bypass stack. There are no post-combustion emission controls installed at any of the Project units.

Redirection of the exhaust gas through the bypass stack will increase the stack exit temperature and decrease the exit velocity (due to a different stack diameter) and thus will slightly alter the current exhaust plume impacts. SCC has submitted the appropriate air dispersion modeling for both the current configuration and the proposed simple cycle operation. The modeling results show there to be virtually no difference in emission impacts when changing operation from cogeneration to simple cycle. However, it should be noted that Sycamore still contributes to an existing violation of the PM<sub>10</sub> 24-hour and annual ambient air quality standards (both federal and state) because it is located in an area that is non-attainment for those standards. These impacts have been mitigated by the offset and mitigation plan originally employed by SCC.

In a simple cycle configuration, Units 1 and 4 are expected to start up and operate for 6 to 8 hours per day and then shut down. Sycamore is expected to operate in response to market demands, which will likely be most frequent in the summer months. However, to be conservative and not incur any additional limiting conditions, SCC has assumed that the Project will operate 24 hours per day 5 days per week (including startup and shutdowns). Sycamore is not expected to have different emission rates during simple cycle operation than cogeneration operation due to the fact that there are no post combustion controls in either configuration. SCC has based their emission rate assumptions on recent source testing, continuous emission monitoring system (CEMS)

and AP-42 emission factors. The AP-42 emissions factors were used only for the startup and shutdown emission estimates of volatile organic compounds (VOC) and were multiplied by 10 to be conservative. Based on emission records and the conservative nature of the assumptions made, staff is confident that SCC can operate Sycamore well within their current emission limits.

### **Minor Modifications of the District Permit**

The District has made a minor modification to the permits for the Sycamore project to be consistent with current District practices. These changes apply to all four combustion turbine generators regardless if they are operated in simple cycle or cogeneration mode. This is the merger of the current sulfur oxide (SO<sub>2</sub> and SO<sub>4</sub>) emission limits into a higher SOx (reported as SO<sub>2</sub>) emission limit. In addition, the District has added a new 1-hr average CO emission limit for startups and shutdowns and extended the current NOx and CO hourly limits to 2-hour averages. These changes do not constitute higher emission limits except for the new 1-hr CO emission limit during startup and shutdown. The proposed emission limits are presented in Air Quality Table 1 and compared to the current emission limits. These minor changes will not constitute a significant change in the Sycamore project emission impacts and thus are not significant.

**AIR QUALITY Table 1**  
**Comparison of Current Short-term Limits (AQ-17 &18) to Proposed Limits**

<b>Pollutant</b>	<b>Current Limit</b>	<b>Proposed Limit</b>	<b>Notes</b>
SO <sub>2</sub>	0.5 lbm/hr	0.9 lbm/hr (SOx as SO <sub>2</sub> )	Combined with SO <sub>4</sub> emission limit
SO <sub>4</sub>	0.6 lbs/hr	Deleted	Combined with SO <sub>2</sub> emission limit
NOx	79.7 lbm/hr	same	1 hour average
NOx – Startup & Shutdown	140 lb/hr	Same	2 hr average
CO - Startup & Shutdown	140 lb/hr	same	2 hr average
CO - Startup & Shutdown	none	200 lb/hr	1 hr average

Finally, SCC proposes that the portions of Condition of Certification AQ-19 that refer to pre-DLN installation combustion turbine emission limits be deleted. Staff does not concur and proposes to retain those portions for historical reference purposes since they do not impact current operations.

### **CONCLUSIONS AND RECOMMENDATIONS**

Staff has analyzed the proposed changes and concludes that there are no new or additional significant impacts associated with approval of the petition. Staff concludes that the proposed changes are based on information that was not available during the

original licensing process. Staff concludes that the proposed language retains the intent of the original Commission Decision and Conditions of Certification. Staff recommends the deletion of Condition of Certification AQ-13 and modifications to Conditions AQ-18 and –19. Additionally, staff recommends changing AQ –30 to be consistent with a previously approved amendment.

## **PROPOSED MODIFICATIONS TO THE AIR QUALITY CONDITIONS OF CERTIFICATION**

New text is underlined and deleted text is in ~~strikethrough~~.

**AQ-13** ~~The Sycamore Project facility shall operate as a cogeneration facility pursuant to Public Resources Code Section 25134 for thermally enhanced oil recovery operations.~~

**Verification:** ~~Sycamore Cogeneration Company shall maintain records on steam production as a portion of the operation log required in Condition AQ-11. The record shall include, but is not limited to hours of operation of the turbines and HRSGs, lb/hr of steam produced and temperature and pressure of steam produced.~~

### **AQ-18**

- a. Start up or planned shut down of a CTG shall not exceed a time period of two (2) continuous hours.
- b. For all CTGs the following ~~hourly~~ emission limits shall apply during times of start up or ~~planned shut down~~ and shall be averaged over the time period specified below ~~two hour period allowed for start up or shut down:~~

NO <sub>2</sub>	140.0 lbm/hr <u>(2-hour average)</u>
CO	<u>200 lbm/hr (1-hour average), and</u> 140.0 lbm/hr <u>(2-hour average)</u>

**Verification:** Sycamore Cogeneration Company shall maintain records necessary to submit quarterly reports to show start up or planned shut down days and daily emissions for those days. This information shall be included in the quarterly reports already submitted to the CEC and SJVUAPCD.

**AQ-19** ~~Pollutant emissions from each combustion turbine prior to being retrofitted with the DLN combustors shall not exceed the following limits, except during times of start up or shutdown, as defined in Condition AQ-18:~~

<del>Gas Fired Case:</del>	
<del>Particulates</del>	<del>5.0 lbm/hr as PM<sub>10</sub></del>
<del>Sulfur Compounds</del>	<del>0.5 lbm/hr as SO<sub>2</sub></del>
	<del>0.6 lbm/hr as SO<sub>4</sub></del>

~~Oxides of Nitrogen~~ ~~140.0 lbm/hr as NO<sub>2</sub>~~  
~~Hydrocarbons~~ ~~2.5 lbm/hr (Non-meth)~~  
~~Carbon Monoxide~~ ~~392 lbm/day~~

Pollutant emissions from each ~~DLN~~-CTG shall not exceed the following limits, except during times of start up or shutdown, as defined in Condition AQ-18:

Gas Fired Case:

Particulates	- 5.0 lbm/hr as PM <sub>10</sub> - 120.0 lbm/day as PM <sub>10</sub>
Sulfur Compounds	- <del>0.5</del> <u>0.9</u> lbm/hr as <u>SO<sub>x</sub> (as SO<sub>2</sub>)</u> <del>- 0.6 lbm/hr as SO<sub>4</sub></del>
Oxides of Nitrogen	- 1629.6 lbm/day and - 67.9 lbm/hr as NO <sub>2</sub> and 16.4 ppmv at 15% O <sub>2</sub> calculated on a 3 hour rolling average. <u>Not to exceed 79.7 lbm/hr, 1-hour average.</u>
Hydrocarbons	- 2.5 lbm/hr (Non-methane)
Carbon Monoxide	- 1056 lbm/day and 25 ppmv at 15% O <sub>2</sub>

Protocol: For nitrogen dioxide, the Sycamore Cogeneration Company (SCC) shall identify the following for each day of operation, except during times of start up or shutdown, as defined in Condition AQ-18:

- (1) The daily maximum hourly mass emission rate (lbs/hr),
- (2) The daily maximum rolling 3-hour average mass emission rate (lbs/hr) and
- (3) The total daily mass emissions (lbs/day).

For carbon monoxide, SCC shall identify the total daily mass emissions (lbs/day) for each day of operation, except during times of start up or shutdown, as defined in Condition AQ-18.

For particulate matter (PM<sub>10</sub>), sulfur compounds (SO<sub>2</sub> and SO<sub>4</sub>) and non-methane hydrocarbons, SCC shall determine through the initial source test, the fuel-based emission factors (lbs/mmBtu) for each pollutant. Using these factors, SCC shall determine the maximum allowable fuel input rate (mmBtu/hr) that would comply with the above stated emission limits (lbs/hr) (i.e., emission limit / emission factor = fuel input rate). SCC shall then compare these fuel input rates (as determined above) with the actual daily maximum fuel input rate (mmBtu/hr) for each day of operation, except during times of start up or shutdown, as defined in Condition AQ-18.

SCC shall submit all excess emission reports and break down reports to demonstrate compliance with all concentration limits.

**Verification:** SCC shall submit quarterly emission reports with all the information identified in the above protocol to the CEC compliance project manager.

**AQ-30** Each CTG shall have a maximum heat input rate of ~~825~~ 1020 MMBtu/hr on an LHV basis. Firing rate limit can be increased upon SJVUAPCD-witnessed emission sampling demonstration that compliance with emission sampling limits can be achieved at higher fuel consumption rates.

**Verification:** See verification for Condition AQ-8.



**SYCAMORE COGENERATION PROJECT (84-AFC-6C)**  
Petition to Allow Either Cogen or Simple Cycle Operations  
Efficiency Analysis  
Prepared by: Steve Baker  
October 4, 2004

**REQUEST**

The Sycamore Cogeneration Company requests that two of the project's four gas turbine generators be allowed to operate in either cogeneration or simple cycle mode.

**BACKGROUND**

The Sycamore project was certified by the Energy Commission as a cogeneration project, in which waste heat from the four gas turbines' exhaust raises steam for use in thermally enhanced oil recovery. Operating in cogeneration mode, as a Qualifying Facility under the Public Utility Regulatory Policies Act of 1978 (PURPA), allowed the project owner to bypass a Notice of Intention and proceed directly to an Application for Certification before the Energy Commission.

**LAWS, ORDINANCES, REGULATIONS, AND STANDARDS**

At the time of certification, certain Qualifying Facilities, as defined under law, were allowed to bypass preparation of a Notice of Intention and proceed directly to an Application for Certification. Public Resources Code, Section 25134, defines a Qualifying Facility in terms of the portion of energy produced that is in the form of cogeneration heat. The Sycamore project qualified by its intention to operate as a cogeneration facility.

**ANALYSIS**

The project was designed to provide steam for oilfield operations as predicted at the time of application. Subsequently, oilfield production has fallen off, reducing the need for steam. However, the demand for electrical generation has grown. Sycamore desires to operate the project to meet electrical demands, while producing only sufficient steam to satisfy current oil production needs.

Operation in simple cycle mode would not affect project fuel efficiency. Further, Sycamore predicts that the two machines to be operated in simple cycle will be dispatched for fewer hours annually than has been the case in the past. Therefore, gas consumption should decrease, while the project is still able to meet dispatch needs for electrical generation.

## **CONCLUSION AND RECOMMENDATION**

The requested change in operation will allow the project to continue to meet electrical dispatch requirements, will not have a negative effect on project fuel efficiency, and will likely result in reduced fuel consumption. The Commission Decision, Part III, Engineering Analysis, subsection A. Conformity with Cogeneration Criteria (pp. 43-44), includes Condition of Certification #1 that requires the power plant to be operated in cogeneration mode only. Staff recommends that this Condition of Certification be deleted and that the petition be approved. This recommendation is based on the following findings:

1. There will be no new or additional significant environmental impacts associated with this action.
2. The petition is based on new information that was not available during the original proceedings.
3. The proposed change retains the intent of the original Commission Decision and Conditions of Certification.

## **RECOMMENDED REVISIONS TO ENGINEERING CONDITIONS OF CERTIFICATION**

The Commission Decision, Part III, Engineering Analysis, subsection A. Conformity with Cogeneration Criteria (Decision, pp. 43-44), Condition of Certification #1:

(deleted text is shown in strikethrough):

1. ~~Over the lifetime of the project, the facility shall be operated as a cogenerating system in accordance with the definition of cogeneration contained in Public Resources Code sections 25134(a) and (b) and Title 18 CFR, sections 292.205(a)(1) and (2)(i)(B).~~

~~Verification: The Sycamore Cogeneration Company (SCC) shall file with the CEC during each calendar year an annual report in which monthly values of plant operating parameters will be set forth in copies of the following documents, with dollar amounts omitted:~~

- a. ~~monthly fuel use (includes quantity and BTU value) as evidenced by an invoice from the gas supplier(s).~~
- b. ~~monthly electrical sales (includes kWh) as evidenced by an invoice to the Southern California Edison Company. In addition, a monthly statement will be submitted for the amount of kilowatt hours that were used for station power and light and line losses.~~
- c. ~~monthly steam sales (includes quantity and BTU value) as evidenced by an invoice to Texaco Producing Inc.~~
- d. ~~if the rate of items a, b, or c above differs by more than  $\pm 5$ ,  $\pm 15$ , and  $\pm 10$  percent, respectively, from rated conditions, SCC (Applicant) will provide at the specific written request of the CEC staff an explanation of such anomaly.~~

## **SYCAMORE COGENERATION PROJECT (84-AFC-6C)**

Petition to Allow Either Cogen or Simple Cycle Operation

License Extension Analysis

Prepared by: Tom Glaviano, Dave Aschuckian, and Nancy Tronaas

October 26, 2004

The Sycamore Cogeneration Company's August 17, 2004 petition to amend the Commission Decision for the 300 MW Sycamore Cogeneration Project (SCP) requests that SCP be allowed to operate in either either simple cycle or cogeneration mode. The petition also requests that the 20-year expiration of the license be released to allow for continued operation of the power plant.

SCP was licensed in 1986. At that time, Public Resources Code sections 25523(f) and 25524(a) required the Energy Commission to determine if a project under consideration for certification conformed to the 12-year forecast of statewide and service area electric power demands that were reflected in the Commission's Electricity Report. Based on the demand analysis conducted at the time of certification, the SCP Decision includes a condition of certification that states: "Certification of the project, as considered during this proceeding, shall expire twenty years following commencement of firm operation, unless extended by act of this Commission or other entity with such authority." [Commission Decision, Sycamore Cogeneration Project, December 10, 1986, Part II, Demand Conformance, (pp. 38-39)]. In 1999, PRC sections 25523(f) and 25524(a) were repealed as an outcome of the restructuring of the state's electricity market, and power plant owners are now at risk to recover their investments. The Energy Commission no longer is required to conduct a demand analysis during the licensing process.

Additionally, according to the Energy Commission's Final Staff Report for the "California Summer 2004, Electricity Supply and Demand Outlook (July 2004), the projected retirement of older natural gas-fired generating units can affect the reserve margins in California. While new generation is expected to improve the supply/demand balances, given unexpected load growth in California experienced during the summer of 2004 which is expected to continue in 2005, reserve margins could fall below five percent in the summer of 2005 which could trigger implementation of voluntary electric load reduction programs. The report also states that new generation will need to be added each year from 2005--2008 in order to maintain system reliability.

Therefore, it is staff's opinion that based on the above, it would appear appropriate for the Energy Commission to encourage the continued operation of power plants that remain in compliance with all conditions of certification, and for the Commission to extend the license of the Sycamore Cogeneration Project indefinitely until such time that the project owner determines that it is no longer economically viable to operate the power plant. The proposed Order approving the petition to amend includes a section that reflects the staff recommendation to extend the license indefinitely.